product user guide

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Title	Issue	Date
Multibrace System	9	February 2015

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1. Introduction

The Multibrace system is intended to be used as a temporary waling system to sheeted excavations. It is not intended for other purposes.
The product is frequently used in combination with:

- Shaftbrace waling system.
- Super Shaftbrace waling system.
- Supershaft Plus waling system.
- Mechanical bracing strut.

Details of these products can be found in the relevant User Guide.
This booklet provides basic information for users of Multibrace to assist them in their preparation of a safe system of work on site.
Refer to Appendix A for details of our Site Demonstrator service.

Multibrace should NOT be used in seawater applications without prior consultation with Mabey Hire.

2. Design

No information on design is included in this booklet.

Clients are strongly advised to ensure that a competent engineer is employed to provide a suitable design for excavation schemes requiring the use of Multibrace products.

Mabey Hire offer a design service and can, on request, also provide information on the strength capacities of Multibrace products for clients undertaking their own designs.

3. Frame Dimensions

This booklet gives information for frame dimensions for Multibrace Walings. When Multibrace is used in combination with Shaftbrace, Super Shaftbrace or Supershaft Plus, consult Mabey Hire staff for frame dimensions.

4. Hydraulic Adjustments

The Multibrace system incorporates a hydraulic system of adjustment which is designed to extend or retract the frames under conditions of no or low loading: e.g. as when first installed or as they become redundant after backfilling the excavation.

Once they are sustaining significant ground loads, hydraulic extension or retraction of the frames is inadvisable and is unlikely to be possible. Methods of working should therefore avoid the need for frame adjustment/removal whilst the walings are heavily loaded.

5. General Guidance Notes

5.1 Safe System of Work and Method Statement

Assuming that the location, plan size and depth of an excavation, together with an arrangement of sheets and frames has already been determined, the Health and Safety at Work Act requires that a safe system of work is adopted to carry out the work on site.

These guidance notes are intended to draw the client's attention to practical aspects of Multibrace installation which need to be considered in compiling method statements for a safe system of work.

In particular, the client's attention is drawn to the lengths and weights of the frame members and the need for planning the lifting operations involved.

All major components of the Multibrace system are fitted with lifting lugs for safe slinging.

Regular users of Mabey Hire's Manhole Brace and Shaftbrace systems should note that the Multibrace system components are considerably heavier.

Two methods of constructing a typical excavation using Multibrace are given on Pages 7 & 8.

5.2 Manpower

The Health and Safety legislation requires that personnel deployed are suitably trained and experienced and supervised by a competent person. All lifting operations are to be controlled by an appointed person in accordance with BS7121 and LOLER regulations.
The main activities associated with Multibrace installation are:

- Unloading the delivery vehicle.
- Bolting up and pinning steelwork together to form walings of the required length.
- Slinging and lifting walings into position in the excavation, and connecting the corners to form frames.
- Connecting the pump to each waling in turn, pressurising the frames and fitting restraint chains.

5.3 Plant and Lifting

A suitable appliance is required for off-loading and installation. For off-loading there needs to be sufficient clearance under the main hook to allow lifting with a safe angle between the lifting sling legs.

WARNING: If an excavator is being used for lifting operations refer to safety information on Page 4.

If the walings are to be lifted into the excavation then the appliance should be located a safe distance from the edge of the excavation and the lifts and radii checked against the safe lifting capacities of the appliance.
A surcharge for the excavator must have been allowed for in the excavation brief / design.
In this booklet it is assumed that the frames will be lifted into the excavation one leg at a time and assembled in the excavation. Likewise for removal it is assumed that the frame will be dismantled in the excavation and the legs removed one at a time. See pages 9 and 10 for further details.

5.4 Small Plant, Tools and Lifting Chains for Handling

Essential equipment required is:

- A compressor with 100 p.s.i. output and sufficient length of air line to power the pump. The pump is fitted with a standard 1/2" BSP air hose claw connector.
- Sledgehammers for making pinned connections.
- Podgers/spanners for making bolted connections. (Bolt sizes are M24 for walings).
- Lifting chains of suitable length and capacity and with current certification. The walings have lifting lugs designed to take size 10 'C' hooks.
  In most cases the centre of gravity of the lifts involved will not be at mid-length so shortening clutches are advisable. Mabey Hire offer sets of 4 leg 10mm chains with 4.0m leg length complete with shortening clutches and safety hooks (Code: SB-LSLG/SH, weight 47Kg) - though clients should check that the leg length is suitable to use with their lifting appliance.

5.5 Edge Protection, Access and Hard Standing Areas

These include:

- Suitable area to off-load the lorry and assemble the walings.
- Suitable hard standings for the lifting appliance to operate from if it is intended to lift the walings into the excavation.
- Ladders and possibly other provisions to provide safe access into the excavation to install restraint chains and connect pump hoses.
- Edge protection, ladders and possibly other provisions to provide safe access into and out of the excavation (Edge Protection and ladder access platforms can be supplied by Mabey Hire Ltd).

5.6 During Excavation Works on Site

If Mabey Hire Ltd have designed the sheeting and frame arrangement for the excavation they will have used ground data provided by the client.

If during the excavation it is noted that the actual ground conditions and/or ground water levels differ from those provided at design stage it is advisable to have the scheme rechecked.

5.7 After Excavation Works are Completed

Plan for edge protection to be installed as early as possible. Regularly inspect the excavation for signs of excessive movements of sheets or walings. Check the hydraulic walings for signs of fluid leakage.
Keep plant, spoil heaps and stored materials well clear from the edge of the excavation.

5.8 Return of Equipment Off Hire

Clients should ensure that on removal, the equipment is returned clean in lengths as supplied.

5.9 Transportation

Ensure all equipment is loaded to the satisfaction of the lorry driver and is securely restrained to the vehicle bed.

5.10 References

5.10.1 Legislation

The Health & Safety at Work Act 1974
The Management of Health and Safety at Work Regs (M.H.S.W.) 1999
The Construction (Design and Management) Regulations 2007
The Control of Substances Hazardous to Health (COSHH) Regulations 1994
The Lifting Operations and Lifting Equipment Regulations (LOLER) 1998
The Provision and Use of Work Equipment Regulations (PUWER) 1998
Work at Height Regulations 2005
Noise
Manual Handling

5.10.2 HSE Guidance

Health and Safety in Construction (HSG150 - rev)
A Guide to Managing Health and Safety in Construction (ISBN 0 7176 0755 0)
Health and Safety in Excavations - Be Safe and Shore (HSG185)
Safe Work in Confined Spaces - Regulations, Approved Code of Practice and Guidance (L101)
Five Steps to Risk Assessment (INDG 163)
Excavators Used as Cranes - Guidance Note PM42

5.10.3 Other Guidance

CPA Guidance	Safety in Shoring - The Proprietary Shoring and Piling Equipment Manual
CPA (STIG) Guidance	STIG 0201 : Selection of Proprietary Shoring Equipment
CPA (STIG) Guidance	TIN 203 : The Use of Restraining Chains to Support Shoring Equipment
CPA (STIG) Guidance	TIN 204 : The Correct Use of Lifting and Other Attachment Points for Shoring Equipment
CPA Safety Guidance	Risk Assessment (SG 003)
CPA Guide Ref No. SG001(3)	Guidance on Lifting Operations in Construction When Using Excavators
CIRIA Report R166	CDM Regulations - Work Sector Guidance for Designers
CIRIA Report 97	Trenching Practice
CIRIA Special Publication 131	Crane Stability on Site
CIRIA Special Publication 95	The Design and Construction of Sheet-Piled Cofferdams

5.10.4 British and European Standards

BS 6031 : 2009 Code of Practice for Earthworks
BS EN 996 : 1996 Piling Equipment. Safety Requirements
BS EN 1997-1 : 2004 Code of Practice for Foundations
BS 5228-1 : 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites : Noise
BS 5228-2 : 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites : Vibration

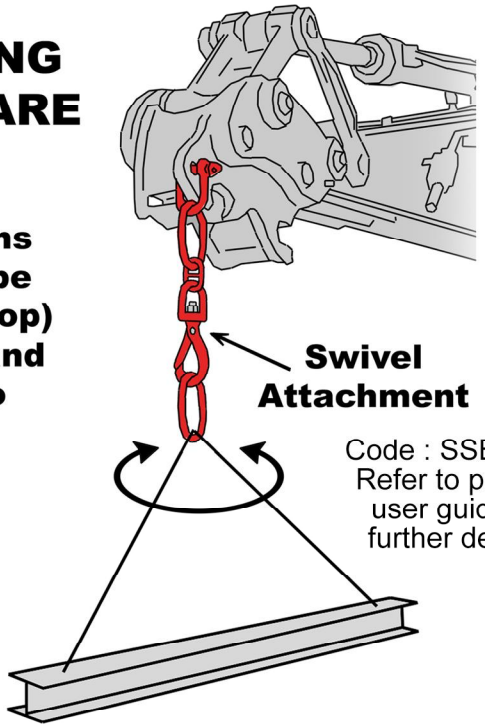
6. Sling Warning

WARNING

IF YOU ARE USING A SLING ON AN EXCAVATOR BEWARE THE FOLLOWING :-

It is very important that a means of allowing the sling to swivel be introduced above the master (top) ring. This will allow the sling, and in particular the master ring, to turn and align with the load.

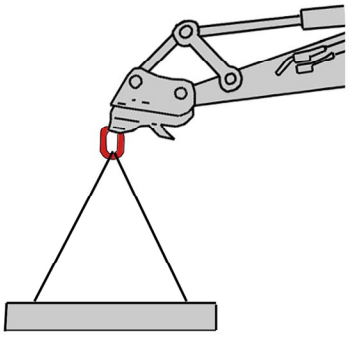
WITHOUT A SWIVEL ARRANGEMENT THE LOAD MAY SEVERELY TWIST THE MASTER RING RESULTING IN DAMAGE OR FAILURE.



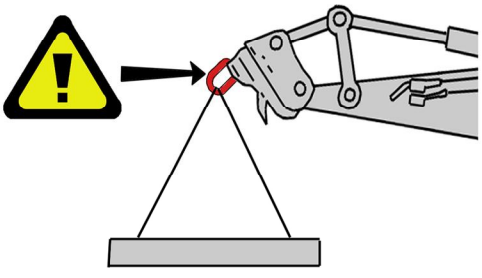
Code : SSBA-007
Refer to product user guide for further details.

All lifting accessories attached to the excavator lifting point must hang freely and be free to move at all times.

TILTING THE HEAD OF THE DIPPER ARM / QUICK HITCH UPWARDS MAY PREVENT FREEDOM OF MOVEMENT AND SO TWIST, DAMAGE OR FAIL THE LIFTING EQUIPMENT.

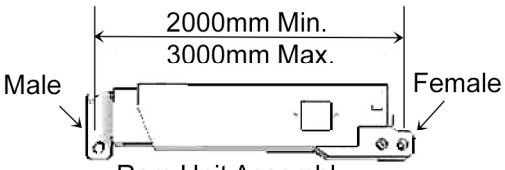


CORRECT

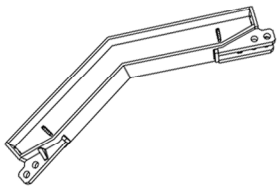


INCORRECT

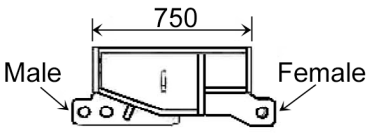
7. Identification of Components



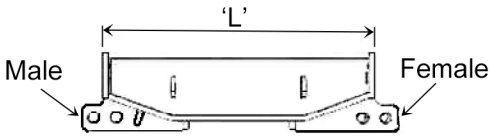
Ram Unit Assembly
Code: MBRACE-001
Weight 640 Kg



Octagonal Extension Unit
NOT CURRENTLY AVAILABLE



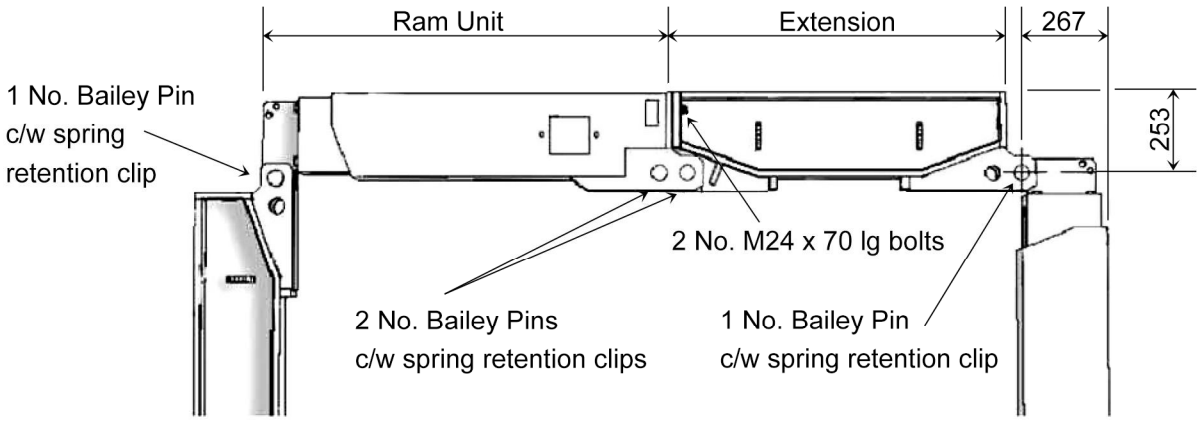
End Extension Unit
Code: MBRACE-015
Weight: 144 Kg



Intermediate Extension Unit		
Code	Length 'L' (mm)	Weight (kg)
MBRACE-010	1325	216
MBRACE-011	1700	256
MBRACE-012	2550	346
MBRACE-013	3400	436
MBRACE-014	4250	526
MBRACE-016	6800	805

Accessories
- Air Powered Hydraulic Pump (Code: SSBA-003), Weight 75 Kg (full).
- 4 Leg Chain Sling (Code: SB-LSLG/SH). Weight 47 Kg. 10mm chain. 4m E.L.L. c/w safety hooks and chain shorteners. Refer to Lifting Chain User Guide for further details.
- Restraint Chain (Code: SHBP-189), Weight 9 Kg. 10mm chain. 2m E.L.L. c/w forged hook. Capacity 2000 Kg. Note: When used in combination with Mabey M11 sheets capacity reduces to 1500 Kg. When used in combination with M6/M7 sheets capacity reduces to 1000 Kg. (See also Page 9).

8. Typical Waling Assembly and Site Connection Details



8.1 Assembly

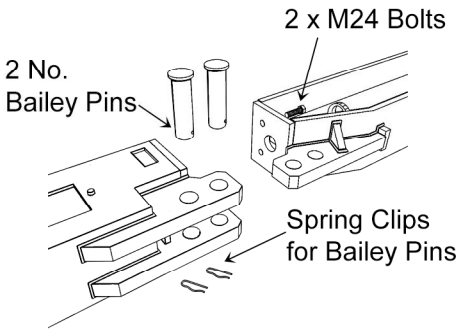
The legs of the brace are made to the correct length range where possible prior to delivery, so that only the corners need be connected using Bailey Pins and spring retention clips. The lug is a close fit in the clevis, so that the legs should be as level as possible during assembly to make it easier to assemble the joint. It is worth spending some time on levelling the ground on which the frame is to be assembled. If the legs have to be altered to another range on site, i.e. by adding or removing an extension section, the intermediate connection detail is used. This consists of 2 No. Bailing Pins and spring retention clips and two M24 bolts, for which a 36mm A/F spanner is required.

IMPORTANT NOTES - Before lifting each leg into the excavation:

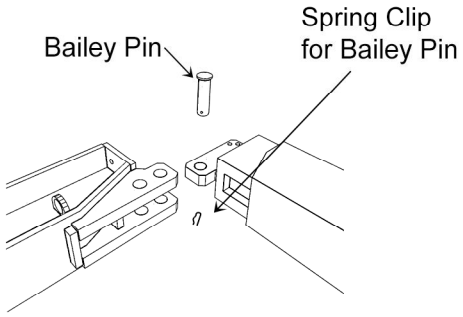
- Ensure that 2 No. Bailey pins are always fitted at each extension to extension and ram to extension connection.
- Ensure that the correct bolt sizes are fitted and that bolts are fully tightened.

8.2 Site Connections for Waling

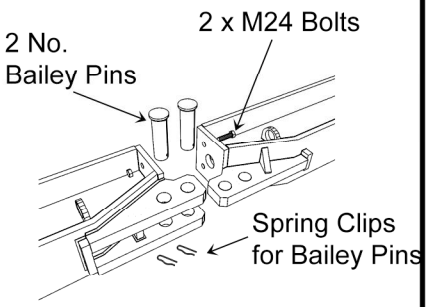
Extensions are normally attached where possible prior to delivery, but to suit site conditions, the extensions can be changed by unbolting the 2 bolts and removing the 2 Bailey Pins.
The leg building process is substantially eased if the components are laid with the connecting lugs upward.



Ram to Extension Connection



Corner Connection

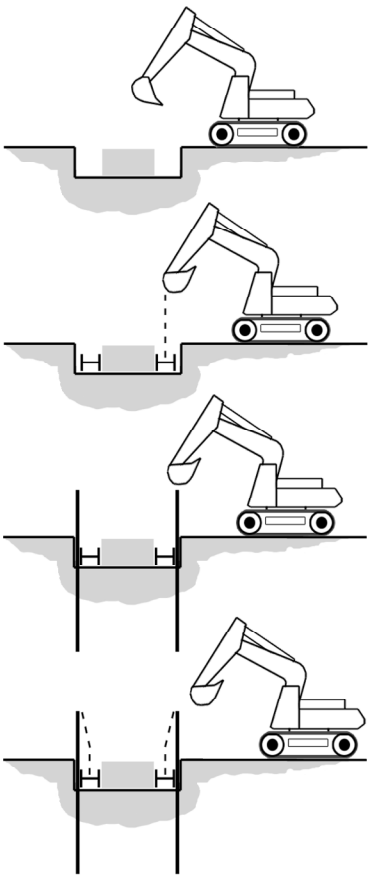


Intermediate Extension to
Intermediate Extension or
End Extension Connection

9. Typical Sequence of Sheets and Frame Installation

Note: Multibrace equipment is not intended to be installed or removed in complete frames - but only as described below, i.e one leg at a time.

9.1 Method 1: Installation of 2 frames by excavator, without piling hammer, placing one leg at a time.
Warning: Refer to safety information on Page 4 regarding excavators being used for lifting operations.

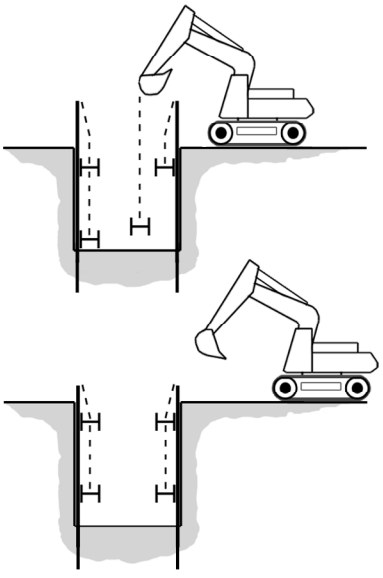


1. Fully excavate to first frame level.
1b. Alternatively excavate slit trench only to first frame level.

2. Place each leg in excavation and assemble the frame. Connect hydraulics and pump frame out to correct dimension. Remove hydraulics.

3. Using the frame and excavated face as a guide, place sheets and using the relevant drive cap, drive with excavator bucket as far as possible.

4. Connect restraint chains as per scheme drawing.
5. Connect hydraulics and individually pressurise all frame ram units to 1000 p.s.i., close lock-off valves and remove hydraulics.



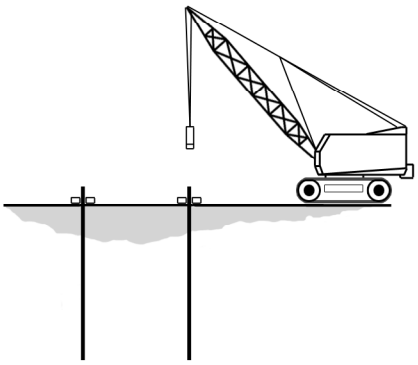
6. Dig through to next frame position and push sheets down.
7. Reposition restraint chains as necessary.
8. Place legs of second frame in excavation and assemble (safe working must be maintained).
9. Attach restraint chains between first and second frames.
10. Connect hydraulics and individually pressurise all lower frame ram units to 1000 p.s.i., close lock-off valves and remove hydraulics.

11. Push sheets down to give “toe-in” required and complete dig.

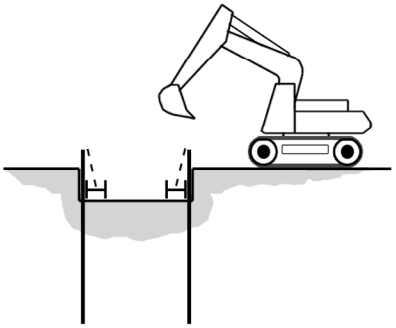
NOTE: 1. This method requires operatives working in the excavation and the contractor must ensure safe working conditions at all times.
2. See Page 9 for notes on use of restraint chains.

9.2 Method 2: Installation of 2 frames by fully driving sheets/piling with piling hammer.
Use the crane for lifting and driving operations and the excavator for digging operations.

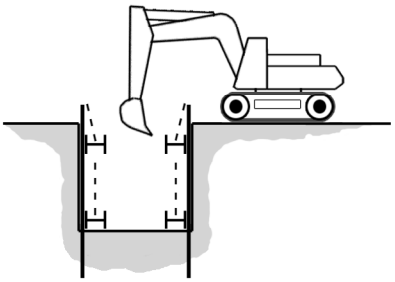
1. Fully drive sheets/piling using a piling guide.



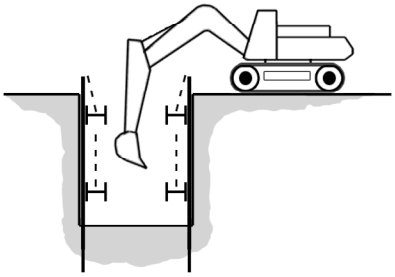
2. Remove piling guide and excavate to first frame level.
3. Place each leg in excavation and assemble the frame.
4. Connect restraint chains.
5. Connect hydraulics and individually pressurise all ram units to 1000 p.s.i., close lock-off valve and remove hydraulics.



6. Dig through to next frame position.
7. Place legs of second frame in excavation and assemble (safe working must be maintained).
8. Attach restraint chains between first and second frames.
9. Connect hydraulics and individually pressurise all lower ram units to 1000 p.s.i., close lock-off valve and remove hydraulics.



10. Complete dig.



NOTE: 1. This method requires operatives working in the excavations and the contractor must ensure safe working conditions at all times.
2. See Page 9 for use of restraint chains.

10. Removal of Frames

Backfill to the underside of the lowest frame and carry out any compaction required. Ensure frame is securely packed or supported from below. Connect hydraulics and individually open lock-off valves (max 2 turns) and fully retract all lower frame ram units. Remove restraint chains. Remove corner pins, attach lifting sling to lifting eyes and lift each leg one at a time from excavation. Follow the above procedure for the upper frame.

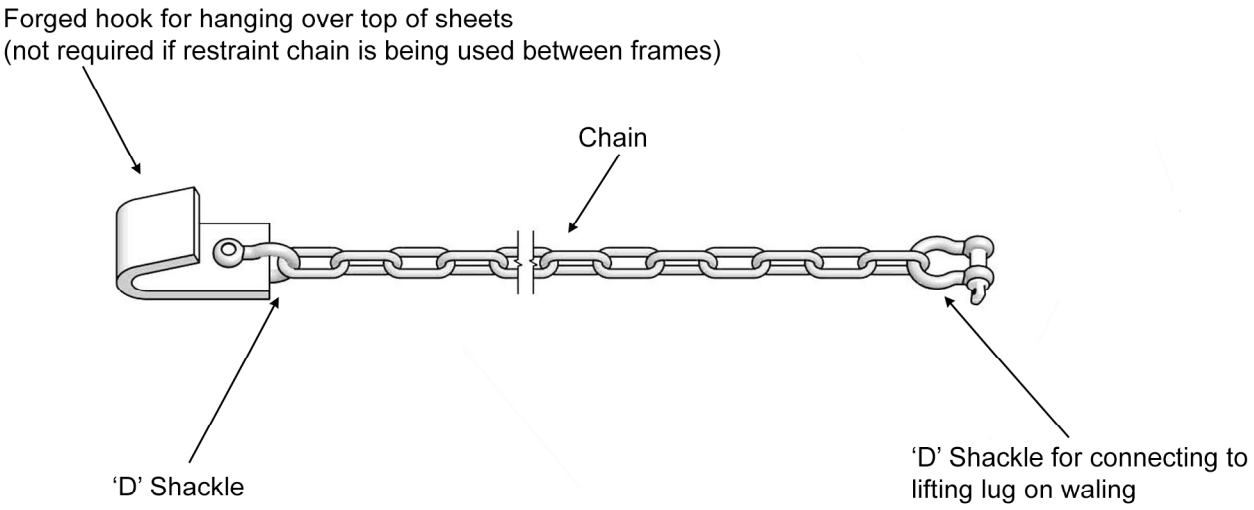
When the frames have been removed and the excavation backfilled, the sheets can be removed, one at a time using a trench sheet extractor.

11. Use of Restraint Chains (SHBP-189) Capacity 2000 Kg*

Restraint chains are provided as a back-up support arrangement in the unlikely event of hydraulic failure of one of the Multibrace hydraulic legs. They are NOT to be used for any other purpose and particularly, are NOT to be used as lifting chains. They are NOT intended as a means of suspension to be relied upon during installation or removal of the frames.

Always ensure all the restraint chains are fitted as per arrangement shown on the scheme drawing, or if no scheme has been prepared 1 No. chain every 2.5m approx of waling, and that as much slack as possible is removed by repositioning the 'D' Shackle.

Users must ensure that frames are securely supported by means other than the restraint chains prior to depressurising the frames.


Forged hook for hanging over top of sheets
(not required if restraint chain is being used between frames)
Chain
'D' Shackle
'D' Shackle for connecting to
lifting lug on waling

*Note: When used with Mabey M11 sheets Restraint Chains capacity reduces to 1500 Kg.
When used with Mabey M6/M7 sheets Restraint Chain capacity reduces to 1000 Kg.

12. Frame Dimensions and Leg Weights

Leg Code	Leg Arrangement	Clear Internal Dimensions (mm)				Dimensions to Face of Sheet		Leg Weight (kg)
		Between Walings Flanges		Between Waling Joints				
		Min	Max	Min	Max	Min	Max	
MBRACEL-01	MBRACE-001	1990	2990	N/A	N/A	2525	3525	640
MBRACEL-01A	MBRACE-001 + MBRACE-015	2740	3740	2625	3625	3275	4275	784
MBRACEL-02	MBRACE-001 + MBRACE-010	3315	4315	3200	4200	3850	4850	856
MBRACEL-03	MBRACE-001 + MBRACE-011	3690	4690	3575	4575	4225	5225	896
MBRACEL-04	MBRACE-001 + MBRACE-012	4540	5540	4425	5425	5075	6075	986
MBRACEL-05	MBRACE-001 + MBRACE-013	5390	6390	5275	6275	5925	6925	1076
MBRACEL-06	MBRACE-001 + MBRACE-014	6240	7240	6125	7125	6775	7775	1166
MBRACEL-07	MBRACE-001 + MBRACE-013 + MBRACE-010	6715	7715	6600	7600	7250	8250	1292
MBRACEL-08	MBRACE-001 + MBRACE-014 + MBRACE-010	7565	8565	7450	8450	8100	9100	1382
MBRACEL-09	MBRACE-001 + MBRACE-014 + MBRACE-011	7940	8940	7825	8825	8475	9475	1422
MBRACEL-10	MBRACE-001 + MBRACE-014 + MBRACE-012	8790	9790	8675	9675	9325	10325	1512
MBRACEL-10	MBRACE-001 + MBRACE-016	8790	9790	8675	9675	9325	10325	1445

Note:

- The clear internal dimensions tabulated do not include any allowance for deflection of the walings under load.
- A deflection allowance should be added to the clear internal dimensions given. Clear internal dimensions should be reduced by: rail length (mm)/30

  e.g. For a 7000 mm pin to pin long rail the clear internal dimension should be reduced by:
  7000/30 = 233 mm i.e. 117 mm per rail
- Allowance should also be made for the depth of sheeting to arrive at the excavation size.
- n/a - Not Applicable.

13. Stacking and Handling

Suitable firm level dry areas should be made available on site for stacking and pre-assembly work.

Suitable lifting equipment of adequate capacity should be provided for off-loading, pre-assembly work, installation and dismantling.

Slinging should always be carried out by suitably experienced and competent personnel. Weight of legs and other components are given on Page 5 and in the table above.

Return pre-assembled legs and struts as supplied from Mabey Hire's Depot.

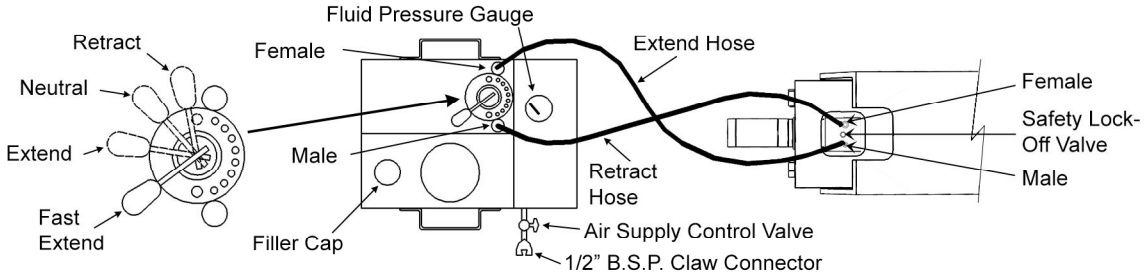
Always stack all items in single layers wherever possible. If space does not permit this, walings should be stacked on 3" x 4" timbers in rows of 4 No. (max height 3 rows).

14. Mechanical Pump Details and Procedures for Extending/Retracting Walings

14.1 Introduction

It is advisable before commencing installation to read the notes below to become familiar with the procedures involved.

The diagram below shows the pump control, gauge, hose connections and safety lock-off valve referred to in the procedures.



14.2 Preliminaries

- Check there is sufficient of the correct Mabey Hire shoring fluid in the tank. Only Mabey Hire shoring fluid should be used.
- Set the pump control valve to "Neutral".
- Connect the pump to a suitable air supply (100 p.s.i. at 14 cu ft/min) and open air supply control valve on pump.
- Purge the hoses of air. To do this connect the hoses together and run the pump for a few seconds with the control valve set to "Extend". When satisfied that any air has been expelled, set the pump control valve to "Neutral".
- At no time must the pump be left operating whilst unattended.

14.3 Mabey Hire shoring fluid

Temp Range (°C)	Shoring Fluid (litres)	Water (litres)
Above 0	5	20
-6 to 0	10	20
-10 to -7	15	15
-10 and below	Neat fluid only	

The pump is normally supplied with a full tank of pre-mixed fluid. If the fluid is separately supplied "neat" in 5 litre orange coloured containers, it should be poured into the pump and cold clean water added according to prevailing temperature conditions. (See table right). Protective gloves should always be worn when handling shoring fluid.
NOTE : A Shoring Fluid safety data sheet is available on request from Mabey Hire Limited.

14.4 Procedure for extending walings to predetermined lengths - either prior to assembly into frames, or to set an assembled frame to a given size

- Ensure each waling is set up level and safely on packs just clear of the ground so that it will be free to extend.
- Set the pump control valve to "Neutral" and ensure air supply valve is open.
- Connect the pump hoses to the ram unit of the waling.
- Open the safety lock-off valve on the waling (by rotating anti-clockwise).
- Set the pump control valve to "Extend".
- Watch the waling extend to the required length.
- Shut down the pump by closing off the air supply valve.
- Close the safety lock-off valve on the ram unit (by rotating clockwise).
- Set the pump control valve to "Neutral".
- Disconnect the pump hoses from the ram.

14.5 Procedure for extending and pressurising walings of a previously installed frame against the sheets of an excavation

- Ensure all restraint chains are in place and the frame is level.
- Set the pump control valve to "Neutral" and ensure air supply valve is open.
- Connect the pump hoses to the ram unit of the first waling.
- Open the safety lock-off valve (by rotating anti-clockwise).
- Set the pump control valve to "Extend".
- Watch the waling extend until the pump gauge starts rising indicating that the frame is beginning to push against the sheets.
- Allow the pressure to build up to 1000 p.s.i. corresponding to a waling load of about 6 tonnes. Shut down the pump by closing off the air supply valve. Check that the hydraulic pressure is being maintained on the gauge.

NOTE: DO NOT MOVE THE PUMP CONTROL VALVE TO NEUTRAL AT THIS STAGE AS THIS WILL SIMPLY RELEASE THE PRESSURE.

- Close the safety lock-off valve (by rotating clockwise).
- Set the pump control valve to "Neutral".
- Disconnect the pump hoses from the ram.
- Repeat the above steps for each waling of the frame in turn.

14.6 Procedure for releasing walings and retraction

- Ensure the waling is secured against dropping before setting about releasing.
- Set the pump control valve to "Neutral" and open the air supply valve.
- Connect the pump hoses to the ram unit of the waling.
- Slowly open the safety lock-off valve to release the hydraulic fluid pressure and allow fluid to flow back through the pump.
- To release frames, it will be necessary to retract the walings in turn by setting the pump control valve to "Retract".
- On completion of retraction close off the air supply valve and set the pump control valve to "Neutral".
- Close lock-off valve in ram unit and disconnect pump hoses from the ram.

15. Do's and Don'ts

DO install the legs of each frame one at a time.
DO install frames as level as possible.
DO use restraint chains between each frame to the top of the sheets.
DO ensure the lock-off valves are open prior to pumping.
DO ensure that the pressure is being held on the rams before closing the lock-off valves.
DO release the pump pressure after closing the lock-off valves to ease removal of hoses.
DO keep the couplers of the hoses dirt free by clipping male and female ends together after use.

DO NOT attempt to install or remove by lifting complete frames.
DO NOT over pressurise the system as this can damage the rails.
DO NOT pressurise a frame with a large gap between the rails and the sheets. A packer must be inserted to fill the gap first.
DO NOT attempt to disconnect a hose until the lock-off valve has been fully closed, and pressure has been released at the pump.
DO NOT release ram pressure by depressing or striking the coupler nipple.
DO NOT use restraint chains as a means of suspension during installation or removal of the frames.

16. General

Since our policy is one of continual improvement, components may vary in detail from the descriptions given in this publication.

mabey hire
part of the mabey family

User Information Appendix A : Provision of a Mabey Hire Site Demonstrator

Mabey Hire can, subject to availability, offer the services of a Site Demonstrator.
However, the Customer should note the following :-

A1. The Customers Responsibilities

A safe system of work remains the Customers responsibility at all times. It is his responsibility to prepare for, organise and direct the operation including :-

A1.1 Site induction for the demonstrator.

A1.2 Preparation of a method statement.

A1.3 A risk assessment.

A1.4 Selection of lifting equipment and any other equipment required to undertake the work.

A1.5 Positioning of the crane or lifting appliance.

A1.6 Banking the crane.

A1.7 Slinging the components.

A1.8 Assembling the components and installing them.

A2. Activities which the Mabey Hire Demonstrator is authorised to carry out

Mabey Hire Demonstrator is authorised to :-

A2.1 Assist in indentification of Mabey Hire components.

A2.2 Explain how they fasten together.

A2.3 Point out slinging points and special methods of lifting as noted in the user information.

A2.4 Demonstrate how to attach hoses and use pumps to extend/retract hydraulic braces.

A2.5 Draw attention to the content of the user information.

A2.6 Clarify queries with Mabey Hire scheme drawings.

The Demonstrator is NOT AUTHORISED to 'take over' or direct the installation.

To : Mabey Hire Limited
(Please return this completed form to the Mabey Hire depot supplying the equipment. Contact details for all the Mabey Hire depots are available both on-line at www.mabeyhire.co.uk/depot-directions/ and within our brochures)

From (Company Name) _____ Site (Address) _____

_____

Tel.No._____ Fax No. _____ _____

Re : Provision of a Mabey Hire Demonstrator on site

We confirm receipt of your User Information Appendix A - and that we would like to request the services of your Demonstrator on the following date(s) _____

Signed _____ Name (print) _____ Date _____